## *In This Section*

- Assessment of Water Quantity
- Assessment of Water Quality

*Section 5*

# Assessments of Water Quantity and Quality

This section provides an evaluation of the current conditions in the Ocmulgee River basin, in terms of both water quantity (Section 5.1) and water quality (Section 5.2) issues. The assessment results are then combined with the evaluation of environmental stressors from Section 4 to produce a listing of Concerns and Priority Issues in Section 6.

## 5.1 Assessment of Water Quantity

General information about water quantity issues in the Ocmulgee River basin is taken from the "Georgia Environmental Protection Water Availability and Use Report, Ocmulgee River Basin," "The Regional Economic Forecast of Population and Employment Comprehensive Study, Volume 1," and updated from other Georgia Environmental Protection Division sources where available.

### 5.1.1 Municipal and Industrial Water Uses

Water use in the basin is both groundwater and surface water for municipal and industrial supplies.

**Overview of Surface Public Water Systems**

Most surface water system plants in the State of Georgia are facilities that utilize conventional treatment, which includes coagulation, flocculation, sedimentation, filtration, and disinfection. There are a number of small package plants which use the same treatment but on a smaller scale. Intakes located in urban areas with upstream development or in rural areas with large amounts of agriculture upstream have higher amounts of sediments (turbidity) in the rivers, streams, and creeks that provide the raw surface water. These waters are prone to sudden erosion and sedimentation problems, also known as flashing, during hard rain storms, which increases the amount of sediment (dirt, mud, and sand) in the water. Water with excess sediment or turbidity can clog intakes (also known as muddying) and filters requiring more sophisticated treatment and higher cost. Many plants have reservoirs to store large amounts of water and to settle out excess sediment (turbidity). Often taste and odor problems come from natural sources of

iron and manganese or algae blooms in shallow surface water. However, algae blooms can also indicate an increase in the level of nutrients in the water. There are 23 municipal surface water permits in this basin.

### 5.1.2 Agriculture

As stated in Section 3.2.2, water demand for agricultural use in the Ocmulgee River basin is considerable. Irrigated crops are grown in Pulaski, Houston, Dodge, Telfair, Ben Hill and other counties in the basin. In 2000 approximately 93 percent of the agricultural water used was for irrigation purposes (99.17 MGD). The remaining 7 percent was used for animal operations. Future agricultural water demand is expected to increase slightly within the basin to 144.08 MGD by the year 2020.

### 5.1.3 Recreation

Recreation activities in this basin include boating, swimming, fishing and picnicking.

### 5.1.4 Hydropower

There are several hydropower facilities in the Ocmulgee River basin.

Lake Jackson, owned and operated by Georgia Power is a major hydropower facility in the Ocmulgee River basin. Lake Juliette is a man-made cooling water storage lake for Plant Scherer also owned and operated by Georgia Power.

Jackson lake is a hydroelectric impoundment that was constructed in 1910. The hydroelectric generating station (Lloyd Shoals) began operation in 1911 and is owned and operated by the Georgia Power Company. The reservoir is located in Newton, Jasper, and Butts counties approximately 50 miles southeast of Atlanta, Georgia. Lake Jackson is a 4,750 acre lake with 135 miles of shoreline. The major tributaries to the lake are the South, Yellow, and Alcovy Rivers and Tussahaw Creek. The water use classification of the lake is Recreation.

Lake Juliette is a 3,600 acre, man-made cooling water storage lake for Plant Scherer, owned and operated by Georgia Power. The lake is located about 17 miles north of Macon, Georgia near the Omulgee River in Monroe County. The lake and surrounding uplands are maintained in cooperation with the Georgia Department of Natural Resources. Lake Juliette is strictly a fishing lake with no private cabins, dock, marinas, beaches or commercial areas. Limited hunting, fishing and camping are allowed.

### 5.1.5 Navigation

There is no commercial navigation in the Ocmulgee basin.

### 5.1.6 Waste Assimilation Capacity

Water quality, wastewater treatment, and wastewater discharge permitting are addressed in Section 4. However, it should be noted that the guidelines for discharge of treated effluent into the rivers and streams of the Ocmulgee River basin assume that sufficient surface water flow will be available to assimilate waste and ensure that water quality criteria will be met.

### 5.1.7 Assessment of Ground Water

At present, sufficient quantities of groundwater remain available for users in the lower half of the Ocmulgee basin. There are no general policy limits on new groundwater permits throughout the basin, even though most users are withdrawing water from the Floridan aquifer. Agricultural irrigation withdrawals in this area are the main use of groundwater. Groundwater use is limited in the northern counties of the basin from Gwinnett through Newton and Butts to Bibb.

Problems have been noted with the Floridan aquifer in the nearby Flint River basin to the west and in the entire coastal area to the east. EPD has had to implement severe policy restrictions on Floridan aquifer users in both these contiguous areas. Such limiting policies are not soon anticipated for the Ocmulgee River basin.

## 5.2 Assessment of Water Quality

This assessment of water quality is generally consistent with Georgia's water quality assessments for CWA Section 305(b) reporting to USEPA. It begins with a discussion of (1) water quality standards, (2) monitoring programs, and (3) data analyses to assess compliance with water quality standards and determine use support. Following this introductory material, detailed assessment results by subbasin are presented in Section 5.2.4.

### 5.2.1 Water Quality Standards

Assessment of water quality requires a baseline for comparison. A statewide baseline is provided by Georgia's water quality standards, which contain water use classifications, numeric standards for chemical concentrations, and narrative requirements for water quality.

Georgia's water use classifications and standards were first established by the Georgia Water Quality Control Board in 1966. The water use classification system was applied to interstate waters in 1972 by EPD. Table 5-1 provides a summary of water use classifications and basic water quality criteria for each water use. Georgia also has general narrative water quality standards, which apply to all waters. These narrative standards are summarized in Table 5-2.

In addition to the basic water quality standards shown above, Congress made changes in the Clean Water Act in 1987 that required each state to adopt numeric limits for toxic substances for the protection of aquatic life and human health. In order to comply with these requirements, in 1989 the Board of Natural Resources adopted 31 numeric standards for protection of aquatic life and 90 numeric standards for the protection of human health. Appendix B provides a complete list of the toxic substance standards that apply to all waters in Georgia. Georgia has adopted all numeric standards for toxic substances promulgated by the USEPA. Georgia is also developing site-specific standards for major lakes where control of nutrient loading is required to prevent problems associated with eutrophication.

**Table 5-I. Georgia Water Use Classifications and Instream Water Quality Standards for Each Use**

| | Bacteria (fecal coliform) | | Dissolved Oxygen (other than trout streams)[2] | | pH | Temperature (other than trout streams)[2] | |
|---|---|---|---|---|---|---|---|
| Use Classification[1] | 30-Day Geometric Mean[3] (#/100 mL) | Maximum (#/100 mL) | Daily Average (mg/L) | Minimum (mg/L) | Std. Units | Maximum Rise (°F) | Maximum (°F) |
| Drinking Water requiring treatment | 1,000 (Nov-Apr)<br>200 (May-Oct) | 4,000 (Nov-Apr) | 5.0 | 4.0 | 6.0-8.5 | 5 | 90 |
| Recreation | 200 (Freshwater)<br>100 (Coastal) | -- | 5.0 | 4.0 | 6.0-8.5 | 5 | 90 |
| Fishing Coastal Fishing[4] | 1,000 (Nov-Apr)<br>200 (May-Oct) | 4,000 (Nov-Apr) | 5.0 | 4.0 | 6.0-8.5 | 5 | 90 |
| Wild River | No alteration of natural water quality | | | | | | |
| Scenic River | No alteration of natural water quality | | | | | | |

1. Improvements in water quality since the water use classifications and standards were originally adopted in 1972 provided the opportunity for Georgia to upgrade all stream classifications and eliminate separate use designations for "Agriculture," "Industrial," "Navigation," and "Urban Stream" in 1993.
2. Standards for Trout Streams for dissolved oxygen are an average of 6.0 mg/L and a minimum of 5.0 mg/L. No temperature alteration is allowed in Primary Trout Streams, and a temperature change of 2 deg. F is allowed in Secondary Trout Streams.
3. Geometric means should be "based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours." The geometric mean of a series of N terms is the Nth root of their product. Example: the geometric mean of 2 and 18 is the square root of 36.
4. Standards are the same as fishing with the exception of dissolved oxygen, which is site specific.

**Table 5-2. Georgia Narrative Water Quality Standards for All Waters (Excerpt from Georgia Rules and Regulations for Water Quality Control Chapter 391-3-6-.03 - Water Use Classifications and Water Quality Standards)**

(5) General Criteria for All Waters. The following criteria are deemed to be necessary and applicable to all waters of the State:

(a) All waters shall be free from materials associated with municipal or domestic sewage, industrial waste or any other waste which will settle to form sludge deposits that become putrescent, unsightly or otherwise objectionable.

(b) All waters shall be free from oil, scum and floating debris associated with municipal or domestic sewage, industrial waste or other discharges in amounts sufficient to be unsightly or to interfere with legitimate water uses.

(c) All waters shall be free from material related to municipal, industrial or other discharges which produce turbidity, color, odor or other objectionable conditions which interfere with legitimate water uses.

(d) All waters shall be free from toxic, corrosive, acidic and caustic substances discharged from municipalities, industries or other sources, such as nonpoint sources, in amounts, concentrations or combinations which are harmful to humans, animals or aquatic life.

(e) All waters shall be free from turbidity which results in a substantial visual contrast in a water body due to man-made activity. The upstream appearance of a body of water shall be observed at a point immediately upstream of a turbidity-causing man-made activity. The upstream appearance shall be compared to a point which is located sufficiently downstream from the activity so as to provide an appropriate mixing zone. For land disturbing activities, proper design, installation and maintenance of best management practices and compliance with issued permits shall constitute compliance with [this] Paragraph...

Georgia is also developing site-specific standards for major lakes where control of nutrient loading is required to prevent problems associated with eutrophication. The Board of Natural Resources adopted lake standards for Jackson Lake for chlorophyll *a,*

pH, total nitrogen, phosphorus, fecal coliform bacteria, dissolved oxygen, and temperature (Table 5-3).

**Table 5-3. Water Quality Standards for Jackson Lake**

(16) **Specific Criteria for Lakes and Major Lake Tributaries**. In addition to the general criteria, the following lake specific criteria are deemed necessary and shall be required for the specific water usage as shown:

(c) Lake Jackson: Those waters impounded by Lloyd Shoals Dam and upstream to Georgia Highway 36 on the South and Yellow Rivers, upstream to Newton Factory Bridge Road on the Alcovy River and upstream to Georgia Highway 36 on Tussahaw Creek.

(i) Chlorophyll *a*: For the months of April through October, the average of monthly mid-channel photic zone composite samples shall not exceed 20 μg/l at a location approximately 2 miles downstream of the confluence of the South and Yellow Rivers at the junction of Butts, Newton and Jasper Counties.

(ii) pH: Within the range of 6.0-9.5 standard units.

(iii) Total Nitrogen: Not to exceed 4.0 mg/l as nitrogen in the photic zone.

(iv) Phosphorous: Total lake loading shall not exceed 5.5 pounds per acre-foot of lake volume per year.

(v) Fecal Coliform: Fecal coliform bacteria shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(I).

(vi) Dissolved Oxygen: A daily average of 5.0 mg/l and no less than 4.0 mg/l at all times at the depth specified in 391-3-6-.03(5)(f).

(vii) Temperature: Water temperature shall not exceed the Recreation criterion as presented in 391-3-6-.03(6)(b)(iv).

(viii) Major Lake Tributaries: For the following major tributaries, the annual total phosphorous loading to Lake Jackson shall not exceed the following:

1. South River at Island Shoals: 179,000 pounds
2. Yellow River at Georgia Highway 212: 116,000 pounds
3. Alcovy River at Newton Factory Bridge Road:55,000 pounds
4. Tussahaw Creek at Fincherville Road: 7,000 pounds

### 5.2.2 Surface Water Quality Monitoring

EPD's monitoring program integrates physical, chemical, and biological monitoring to provide information for water quality and use attainment assessments and for basin planning. EPD monitors the surface waters of the state to:

- collect baseline and trend data,
- document existing conditions,
- study impacts of specific discharges,
- determine improvements resulting from upgraded water pollution control plants,
- support enforcement actions,
- establish wasteload allocations for new and existing facilities,
- verify water pollution control plant compliance,
- document water use impairment and reasons for problems causing less than full support of designated water uses, and
- develop Total Maximum Daily Loads.

EPD used a variety of monitoring tools to collect information for water quality assessments and basin planning. These tools include trend/basin/TMDL monitoring, intensive surveys, lake, coastal, biological, fish tissue, toxic substance monitoring, and facility compliance sampling. Each of these is briefly described in the following sections.

**Trend/Basin/TMDL Monitoring**

Long-term monitoring of streams at strategic locations throughout Georgia, trend or ambient monitoring, was initiated by EPD during the late 1960s. This work was and continues to be accomplished to a large extent through cooperative agreements with federal, state, and local agencies that collect samples from groups of stations at specific, fixed locations throughout the year. The cooperating agencies conduct certain tests in the field and send stream samples to EPD for additional laboratory analyses. Although there have been a number of changes over the years, much of the routine chemical trend monitoring is still accomplished through similar cooperative agreements.

Today EPD contracts with the United States Geological Survey (USGS) for the statewide trend sampling work and with the Columbus Water Works for samples on the Chattahoochee below Columbus. In addition to monthly stream sampling, a portion of the work with the USGS involves continuous monitoring at several locations across the state. EPD associates also collect water and sediment samples for toxic substance analyses, as well as macroinvertebrate samples to characterize the biological community at selected locations as a part of the trend monitoring effort. In 2000, EPD added two sampling teams, one stationed in Brunswick and one in Atlanta. The Brunswick sampling team conducts monthly sampling across south Georgia in the Ochlockonee, Suwannee, Satilla, Altamaha, Savannah and Ogeechee River basins. The Atlanta sampling team conducts monthly sampling in parts of the Coosa, Tallapoosa, Chattahoochee, Flint, Oconee, and Ocmulgee River basins. WRD associates assess fish communities as a part of the monitoring effort. Additional samples used in the assessment were collected by other federal, state and local governments, universities, contracted Clean Lakes projects and utility companies.

**Focused Monitoring in the Ocmulgee River Basin**

In 1995, EPD adopted and implemented significant changes to the strategy for trend monitoring in Georgia. The changes were implemented to support the River Basin Management Planning program. The number of fixed stations statewide was reduced in order to focus resources for sampling and analysis in a particular group of basins in any one year in accordance with the basin planning schedule. Sampling focus was placed on the Altamaha, Ocmulgee, and Oconee River basins during 1999.

Figure 5-1 shows the focused monitoring network for the Ocmulgee River basin used in 1999. During this period, trend monitoring was continued at a number of station locations statewide and at continuous monitoring locations. The remainder of the trend monitoring resources were devoted to the Altamaha, Ocmulgee, and Oconee River basins. As a result, more sampling was conducted in the focus river basins. Increasing the resolution of the water quality monitoring improves the opportunity to identify impaired waters, as well as the causes of impairment.

**Intensive Surveys**

Intensive surveys complement long-term fixed station monitoring to focus on a particular issue or problem over a shorter period of time. Several basic types of intensive surveys are conducted, including model calibration surveys and impact studies. The purpose of a model calibration survey is to collect data to calibrate a mathematical water quality mode. Models are used for wasteload allocations and/or TMDLs and as tools for use in making regulatory decisions. Impact studies are conducted when information on

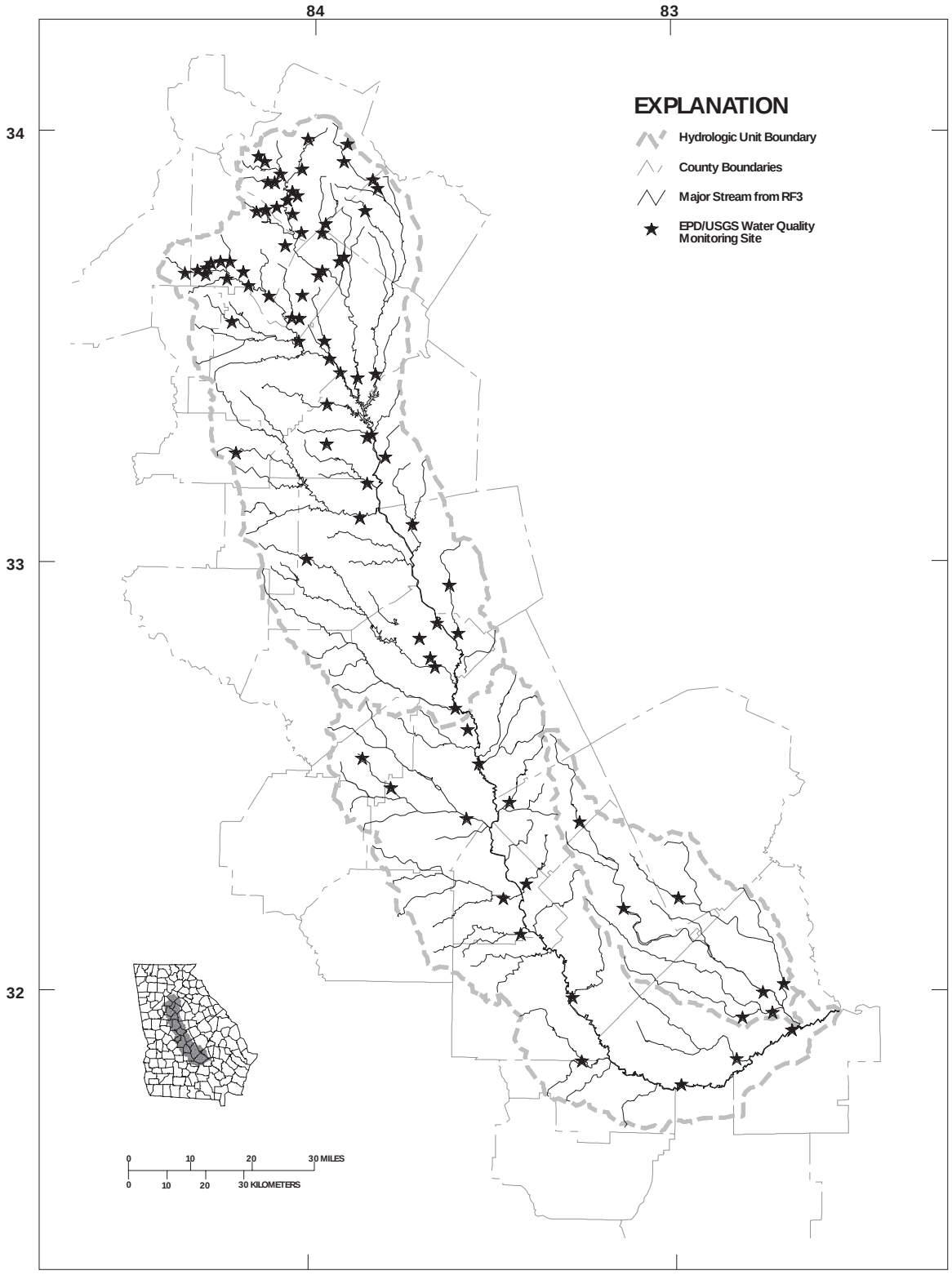


**Figure 5-I. Ocmulgee River Basin Trend Monitoring Network Station Locations**

the cause-and-effect relationships between pollutant sources and receiving waters is needed. In many cases, biological information is collected along with chemical data for use in assessing environmental impacts.

**Lake Monitoring**

EPD has maintained monitoring programs for Georgia's public access lakes for many years. In the late 1960s, a comprehensive statewide study was conducted to assess fecal coliform levels at public beaches on major lakes in Georgia as the basis for water use classifications and establishment of water quality standards for recreational waters. In 1972, EPD staff participated in the USEPA National Eutrophication Survey, which included 14 lakes in Georgia. A postimpoundment study was conducted for West Point Lake in 1974. Additional lake monitoring continued through the 1970s. The focus of these studies was primarily problem/solution-oriented and served as the basis for regulatory decisions.

In the 1990s, EPD conducted Clean Lakes Phase I Diagnostic – Feasibility studies on several major lakes. One of the studies was conducted on Jackson Lake. The study results were used as the basis for establishing lake-specific water quality standards for Jackson Lake in 1996 (see Table 5-3). Subsequent annual monitoring data have shown compliance with the lake-specific water quality standards for Jackson Lake.

**Trophic Condition Monitoring**

In 1980-1981, EPD conducted a statewide survey of public access freshwater lakes. The study was funded in part by USEPA Clean Lakes Program funds. The survey objectives were to identify freshwater lakes with public access, assess each lake's trophic condition, and develop a priority listing of lakes as to need for restoration and/or protection. In the course of the survey, data and information were collected on 175 identified lakes in 340 sampling trips. The data collected included depth profiles for dissolved oxygen, temperature, pH, specific conductance, and Secchi disk transparency and chemical analyses for chlorophyll *a*, total phosphorus, nitrogen compounds, and turbidity.

The three measures of Carlson's Trophic State Index were combined into a single total trophic state index (TTSI) and used with other field data and observation to assess the trophic condition of each lake. Higher values of the TTSI represent more eutrophic, less desirable conditions. Monitoring efforts have continued since the 1980-1981 Lake Classification Survey with a focus on major public lakes (those with a surface area greater than 500 acres), and the TTSI has continued to be employed as a tool to mark trophic state trends. The monitoring project for major lakes became a part of the River Basin Management Planning process in 1995, with resumption of basin cycle lake quarterly monitoring in 1997. The major lakes in the Ocmulgee basin are listed in Table 5-4 and are ranked for the years of 1985-1993 and 1999 (basin monitoring year in the 5-year cycle period of 1997-2001). Lake Jackson was not only monitored annually through 1993 as part of the major lakes monitoring project, but was also the subject of a Phase I Diagnostic-Feasibility study conducted by the EPD in the early 1990s.

**Table 5-4. Major Public Lakes in the Ocmulgee River Basin Ranked by Sum of Trophic State Index Values, 1985-1993 and 1999 (of the 1997-2001 Basin Monitoring Cycle)**

| 1985 | | 1986 | | 1987 | | 1988 | | 1989 | |
|---|---|---|---|---|---|---|---|---|---|
| Jackson | 172 | Jackson | 170 | Jackson | 170 | High Falls | 177 | High Falls | 191 |
| High Falls | 168 | High Falls | 163 | High Falls | 157 | Jackson | <158 | Jackson | 188 |
| Tobesofkee | 152 | Tobesofkee | 155 | Tobesofkee | <146 | Tobesofkee | <151 | Tobesofkee | 180 |
| Juliette | 125 | Juliette | 135 | Juliette | <108 | Juliette | <123 | Juliette | 141 |
| *range for state* | 116-188 | *range for state* | 114-177 | *range for state* | <108-184 | *range for state* | 111-178 | *range for state* | 123-209 |
| **1990** | | **1991** | | **1992** | | **1993** | | **1999 (of 1997-2001)** | |
| Tobesofkee | 173 | High Falls | 190 | High Falls | 194 | High Falls | 195 | High Falls | 169 |
| Jackson | 168 | Jackson | 162 | Tobesofkee | 176 | Jackson | 173 | Tobesofkee | 164 |
| High Falls | 159 | Tobesofkee | 149 | Jackson | 166 | Tobesofkee | 169 | Jackson | 161 |
| Juliette | 132 | Juliette | 133 | Juliette | 131 | Juliette | 136 | Juliette | 131 |
| *range for state* | 118-182 | *range for state* | 121-193 | *range for state* | 131-194 | *range for state* | 122-195 | *range for state (1997-2001)* | 119-169 |

Note: Higher values represent more eutrophic conditions.

### DNR State Park Lake Swimming Beach Monitoring

The DNR Parks, Recreation and Historic Sites Division (PRHSD), operates public beaches on small lakes and reservoirs at some of the state parks in Georgia. State park beach monitoring of fecal coliform bacteria was conducted on a periodic park-by-park basis prior to 1996. Since 1996, an annual lake swimming beach monitoring project has been conducted by DNR at freshwater inland beaches operated by the PRHSD and will be continued as resources allow.

### Fish Tissue Monitoring

The DNR conducts fish tissue monitoring for toxic chemicals and issues fish consumption guidelines as needed to protect human health. It is not possible for the DNR to sample fish from every stream and lake in the state; however, high priority has been placed on the 26 major reservoirs that make up more than 90 percent of the total lake acreage. These lakes will continue to be sampled as part of the River Basin Management Planning 5-year rotating schedule to track trends in fish contaminant levels. The DNR has also made sampling fish in rivers and streams downstream of urban and/or industrial areas a high priority. In addition, DNR will focus attention on areas that are frequented by a large number of anglers.

The program includes testing of fish tissue samples for the 43 substances listed in Table 5-5. The test results have been used to develop consumption guidelines, which are updated annually and provided to fishermen when they purchase fishing licenses. As of 2003, PCBs, mercury, dieldrin, and DDT residues (DDD and DDE) have been found in fish at concentrations that could create risk to human health from fish consumption. Guidelines are listed in one location each for dieldrin and DDD/DDE; however, there are guidelines for PCBs and mercury throughout Georgia. In the Ocmulgee River basin, there are guidelines for mercury and PCBs only.

In general, levels of PCBs are decreasing as time passes. PCBs are no longer produced in the U.S., but they do not break down easily and remain in aquatic sediments for years. Mercury is a naturally occurring metal that does not break down. While low background levels are normal, concentrations of mercury have increased since the late 1800s. It is not known whether the increase is due to municipal and industrial sources, fossil fuel use, or nonpoint sources. There is evidence that mercury is transported great

distances in the upper atmosphere, and the pool of airborne mercury is both a byproduct of waste incineration and some industrial processes, and natural sources such as volcanoes.

In 1994, EPD began utilizing a "risk-based" approach to develop fish consumption guidelines for the state's waters. The EPD's guidelines are based on the use of USEPA potency factors for carcinogenicity and reference doses for noncancer toxicity, whichever is most protective. Inputs used in the derivation of guidelines include a 1 X $10^{-4}$ risk level for cancer, a 30-year exposure duration, 70 kg as body weight for an adult, and 70 years as the lifetime duration. A range of possible intakes from a low of 3 g/day to a high of 30 g/day is evaluated and one of four different recommendations made: no restriction, limit consumption to one meal per week, limit consumption to one meal per month, or do not eat. Recommendations are made specific to fish species and size classes.

**Table 5-5. Parameters for Fish Tissue Testing**

| | | |
|---|---|---|
| Antimony | a-BHC | Heptachlor |
| Arsenic | b-BHC | Heptachlor Epoxide |
| Beryllium | d-BHC | Toxaphene |
| Cadmium | g-BHC (Lindane) | PCB-1016 |
| Chromium, Total | Chlordane | PCB-1221 |
| Copper | 4,4-DDD | PCB-1232 |
| Lead | 4,4-DDE | PCB-1242 |
| Mercury | 4,4-DDT | PCB-1248 |
| Nickel | Dieldrin | PCB-1254 |
| Selenium | Endosulfan I | PCB-1260 |
| Silver | Endosulfan II | Methoxychlor |
| Thallium | Endosulfan Sulfate | HCB |
| Zinc | Endrin | Mirex |
| Aldrin | Endrin Aldehyde | Pentachloroanisole |
| | | Chlorpyrifos |

### Toxic Substance Stream Monitoring

EPD has focused resources on the management and control of toxic substances in the state's waters for many years. In the 1970s and 1980s, EPD incorporated specific limitations on toxic pollutants in NPDES discharge permits wherever discharges were found to have toxic impacts or to include toxic pollutants.

In 1983, EPD intensified toxic substance stream monitoring efforts. This expanded toxic substance stream monitoring project includes facility effluent, stream, sediment, and fish sampling at specific sites downstream of selected industrial and municipal discharges. From 1983 through 1991, 10 to 20 sites per year were sampled as part of this project. This work was used as the foundation for additional limitations in NPDES permits designed to implement the toxic substance standards adopted in the late 1980s. Monitoring for toxic substances is now accomplished as needed as part of the river basin monitoring programs.

### Facility Compliance Sampling

In addition to surface water quality monitoring, EPD conducts evaluations and compliance sampling inspections of municipal and industrial water pollution control plants. Compliance sampling inspections include the collection of 24-hour composite

samples, as well as evaluation of the permittee's sampling and flow monitoring requirements.

EPD staff conducted more than 350 sampling inspections statewide in 1999. The results were used, in part, to verify the validity of permittee self-monitoring data and as supporting evidence, as applicable, in enforcement actions. Also, sampling inspections can lead to identification of illegal discharges. In 1999, this work was focused on facilities in the Altamaha, Ocmulgee, and Oconee River basins in support of the basin planning process.

**Aquatic Toxicity Testing**

In 1982, EPD incorporated aquatic toxicity testing into selected industrial NPDES permits. In January 1995, EPD issued approved NPDES Reasonable Potential Procedures, which further delineated required conditions for conducting whole effluent toxicity (WET) testing for municipal and industrial discharges. All major permitted discharges (flow greater than 1 MGD) are required to have WET tests run with each permit reissuance. Certain minor dischargers are also subject to this requirement if EPD determines that aquatic toxicity is a potential issue.

### 5.2.3 Data Analysis

**Assessment of Use Support - General Procedures**

EPD assesses water quality data to determine if water quality standards are met and if the water body supports its classified use. Depending on the frequency with which standards are not met, the water body is said to be supporting, partially supporting, or not supporting the designated use (see Box 5-1).

Appendix D includes lists of all streams and rivers in the basin for which data have been collected and assessed. The lists include information on the location, data source, designated water use classification, and where standards are exceeded. Additional information is provided on the criterion violated, potential cause, actions planned to alleviate the problem, and estimates of stream miles affected. The lists are further coded to indicate status of each water body under several sections of the CWA. Different sections of the CWA require states to assess water quality (Section 305(b)), to list waters still requiring TMDLs (Section 303(d)), and to document waters with nonpoint source problems (Section 319).

The assessed waters are described in three categories: waters supporting designated uses, waters partially supporting designated uses, and waters not supporting designated uses. Waters were placed on the partially supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in 11 percent to 25 percent of the samples collected.
- Fish consumption:
  a) For all contaminants other than mercury, a fish consumption guideline for limited consumption was in place for the water body.
  b) For mercury, the Trophic-Weighted Residue Value was greater than 0.3 mg/kg but less than 2 mg/kg (see Box 5-2).

Generally, a stream reach was placed on the not supporting list if:

- The chemical data (dissolved oxygen, pH, temperature) indicated an excursion of a water quality standard in greater than 25 percent of the samples collected.
- Acute or chronic toxicity tests documented or predicted toxicity at low stream flow (7Q10) due to a municipal or industrial discharge to the water body.
- Fish consumption:

a) For all contaminants other than mercury, a fish consumption guideline for no consumption or a commercial fishing ban was in place for the water body.

b) For mercury, the Trophic-Weighted Residue Value was greater than or equal to 2 mg/kg (see Box 5-2).

Additional specific detail is provided in Box 5-1 on analysis of data for fecal coliform bacteria, metals, toxicity, dissolved oxygen, pH, temperature, fish/shellfish consumption guidelines, and biotic data.

## Box 5-I: Analysis of Data for Fecal Coliform Bacteria, Metals, Toxicity, Dissolved Oxygen, pH, Temperature, Fish/Shellfish Consumption Guidelines, and Biotic Data

***Fecal Coliform Bacteria***

Georgia water quality standards establish a fecal coliform criterion of a geometric mean (four samples collected over a 30-day period) of 200 MPN/100 mL for all waters in Georgia during the recreational season of May through October. This is the year-round standard for waters with the water use classification of recreation. For waters classified as drinking water, fishing, or coastal fishing, for the period of November through April, the fecal coliform criterion is a geometric mean (four samples collected over a 30-day period) of 1000 per 100 mL and not to exceed 4000 per 100 mL for any one sample. The goal of fecal coliform sampling in the Ocmulgee River basin focused monitoring in 1999 was to collect four samples in a 30-day period in each of four quarters. If one geometric was in excess of the standard then the stream segment was placed on the partial support list. If more than one geometric mean was in excess of the standard, the stream segment was placed on the not support list.

In some cases, the number of samples was not adequate to calculate geometric means. In these cases, the USEPA recommends the use of a review criterion of 400 per 100 mL to evaluate sample results. This bacterial density was used to evaluate data for the months of May through October and the maximum criterion of 4000 per 100 mL was used in assessing the data from the months of November through April. Thus, where geometric mean data was not available, waters were deemed not supporting uses when 26 percent of the samples had fecal coliform bacteria densities greater than the applicable review criteria (400 or 4000 MPN/100 mL) and partially supporting when 11 to 25 percent of the samples were in excess of the review criterion.

***Metals***

Since data on metals from any one given site are typically infrequent, using the general evaluation technique of 26 percent excursion to indicate nonsupport and 11 to 25 percent excursion to indicate partial support was not meaningful. Streams were placed in the nonsupporting category if multiple excursions of state criteria occurred and the data were based on more than four samples per year. With less frequent sampling, streams with excursions were placed on the partially supporting list. In addition, an asterisk appears beside metals data in those cases where there is a minimal database. Data were collected in the winter and the summer seasons in 1999 for comparison to water quality standards. Clean techniques were used. If one of the samples was in excess of the standard, the stream segment was placed on the partial support list. This approach is in accordance with US USEPA guidance, which suggests any single excursion of a metal's criterion be listed.

***Toxicity Testing/Toxic Substances***

Data from EPD toxicity testing of water pollution control plant effluents were used to predict toxicity in the receiving water body at critical, 7Q10 low flows. Effluent data for metals were used to designate either partial support or nonsupport based on whether instream corroborating metals data were available. When instream metals data were available the stream was determined to be not supporting if a metal concentration exceeded stream standards; when instream data were not available, the stream was listed as partially supporting.

***Dissolved Oxygen, pH, Temperature***

When available data indicated that these parameters were out of compliance with state standards more than 25 percent of the time, the waters were evaluated as not supporting the designated use. Between 11 percent and 25 percent noncompliance resulted in a partially supporting evaluation.

***Fish/Shellfish Consumption Guidelines – Mercury***

Risk to human health from consuming fish with mercury residue was assessed using a protocol that evaluates species and size classes in different trophic levels that are sought by fishermen. Mercury concentrations in fish tissue were used to calculate the Trophic-Weighted Residue Value for each water body. If the Value is greater than 0.3 mg/kg (mg of mercury per kilogram of fish tissue, wet weight) but less than 2.0 mg/kg, a water body was placed in the partially supporting category. If the Value is greater than or equal to 2.0 mg/kg, a water body was placed in the not supporting category. See Box 5-2 for more details.

***Fish/Shellfish Consumption Guidelines – Contaminants Other than Mercury***

A water body was included in the not supporting category when a recommendation for "no consumption" of fish, a commercial fishing ban, or a shell fishing ban based on actual data was in effect. A water body was placed in the partially supporting category if a guideline for restricted consumption of fish had been issued for the waters.

***Biotic Data***

A "Biota Impacted" designation for "Criterion Violated" indicates that studies showed a modification of the biotic community. Communities used were fish. Studies of fish populations by the DNR Wildlife Resources Division used the Index of Biotic Integrity (IBI) to identify affected fish populations. The IBI values were used to classify the population as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as "Poor" or "Very Poor" were included in the partially supporting list.

### Box 5-2: Mercury in Fish Tissue – New Method For Assessment of Impairment

Fish consumption guidelines provide site-specific information on safe consumption levels to sport anglers and their families, and have an important role in educating the public about concepts of environmental science and toxicology. They have also been used as a basis for assessing the impairment of rivers and lakes under Section 305(b) of the federal Clean Water Act (CWA). Until 2002, all bodies of water with fish consumption guidelines were also included in the 305(b) list of impaired waters. EPD developed fish consumption guidelines based on a risk-based method using USEPA potency factors, reference doses, and methodology consistent with that developed by the USEPA. Under this approach, guidelines are determined for individual fish species and for size classes of fish within a species. If a reduced consumption or do not eat guideline or commercial fishing ban existed for a fish species in a water body, that water body was also assessed as not fully supporting its designated use, and therefore was placed on the 305(b)/303(d) list.

In 2001, USEPA promulgated a new human health criterion for methylmercury in fish tissue (USEPA, 2001). Methylmercury accounts for the majority of mercury in fish tissue, and is the most toxic form. The criterion was developed using new information in the Mercury Study Report to Congress (USEPA, 1997) and the 2000 Human Health Methodology (USEPA, 2000), and incorporated national dietary patterns of consumption across different trophic levels into the risk assessment. EPD developed a protocol based on the USEPA criterion and used it to assess mercury levels in fish tissue. In December 2002, EPD adopted as a human health standard for total mercury in fish tissue, 0.3 mg/kg wet weight as a water body Trophic-Weighted Residue Value.

The protocol method considers trophic levels of fish instead of individual species. Trophic level is a term used by environmental scientists to assign an animal's place in the food chain. Animals that consume plants (called herbivores) have a low trophic level, while animals that consume other animals (carnivores) have a higher trophic level. The largest predatory animals in the food chain occupy the highest trophic level. Trophic levels are important for assessing exposure to contaminants because of a process known as bioaccumulation. Bioaccumulation occurs as animals consume food containing contaminants, and results in higher concentrations of contaminants at higher trophic levels. For instance, very small fish consume plants and plankton that have absorbed mercury from the water. The mercury accumulates in tissue throughout their lives. Larger fish eat small fish, and the mercury in the small fish is absorbed in the tissue of the larger fish. The end result is that very low concentrations of mercury in the environment get magnified in the largest animals in a food chain. The protocol summarizes data across trophic levels weighted by averages of public consumption to arrive at a number called the Trophic-Weighted Residue Value.

By assessing concentrations of mercury in fish tissue by trophic level, and by accounting for the percentage of fish from each trophic level that people typically eat, a measure of risk can be calculated for an entire water body at one time. The new protocol for evaluating mercury in fish tissue has been applied only to assessment of use support under the Clean Water Act. Georgia continues to publish fish consumption guidelines to the general public using the previous method for mercury – in other words, the guidelines are developed for individual species and size classes as they have been in the past.

At first this might seem contradictory, but the public fish consumption guidelines given to fishermen have a different purpose than the method used to assess whether a water body is impaired. The public fish consumption guidelines give people specific information for species and sizes, and meal frequencies for each. On the other hand, the assessment protocol for mercury is designed to inform regulatory decision-making for water bodies as a whole, using a water quality standard based on bioaccumulation. As an example, one lake had ten guidelines, nine of which were "no restriction." The restriction was for the largest size class of largemouth bass, and for the least restrictive meal limit (one meal per week). The majority of fish had no contaminant concentrations above any level of concern. Overall, the risk of eating fish from this lake was lower than the threshold value, so it was no longer listed as being impaired on the 305(b)/303(d) list (which would have resulted in the long-term commitment of significant resources). However, the guideline remained on the public fish consumption guidelines based on data for that one size class of largemouth bass.

### 5.2.4 Assessment of Water Quality and Use Support

This section provides a summary of the assessment of water quality and support of designated uses for streams and major lakes in the Ocmulgee River basin. Most of these results were previously summarized in the Georgia 2002 305(b)/303(d) listing (Georgia DNR, 2002). Results are presented by HUC. A geographic summary of assessment results is provided by HUC in Figures 5-2 through 5-4.

**Upper Ocmulgee River Subbasin (HUC 03070103)**

Appendix D summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2002).

Monitoring data was collected from 68 stations located within this subbasin during 1999. Of those, seven are sampled monthly each year and the remaining were sampled only during 1999 as part of the focused trend monitoring strategy described in Section 5.2.2. The following assessment is based on data primarily from 1999.

Four segments of the Ocmulgee River and 66 tributary segments were assessed as fully supporting the water use classification of fishing, drinking water, and/or recreation. Criteria affecting use support are discussed in the following subsections for this HUC.

*Erosion and Sedimentation*

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment, which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are 39 stream segments listed in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

*Fecal Coliform Bacteria*

The water use classification of fishing and/or drinking water was not fully supported in one Ocmulgee River segment, 58 tributary stream segments, and a 650 acre portion of Jackson Lake due to exceedances of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and/or animal wastes.

*Fish Tissue*

The water use classification of fishing was not fully supported in one segment of the Ocmulgee River (flathead catfish), one segment of the South River (largemouth bass), and in Jackson (channel catfish) and High Falls Lakes (largemouth bass and channel catfish) based on the listing of fish consumption guidelines recommended due to PCB residues in fish tissue. In High Falls Lake, new fish tissue data has been collected and assessed that documents that PCB residues have decreased below significant levels (DNR, 2003), and therefore it will be de-listed in the 2004 305(b)/303(d) list.

The water use classification of drinking water was not fully supported in Big Haynes Reservoir in Rockdale County based on mercury residues in fish tissue. The assessment for mercury in fish tissue is based on Trophic-Weighted Residue Value being in excess of 0.3 mg of mercury per kilogram of fish tissue. See Box 5-2 for details regarding assessment of mercury in fish tissue.

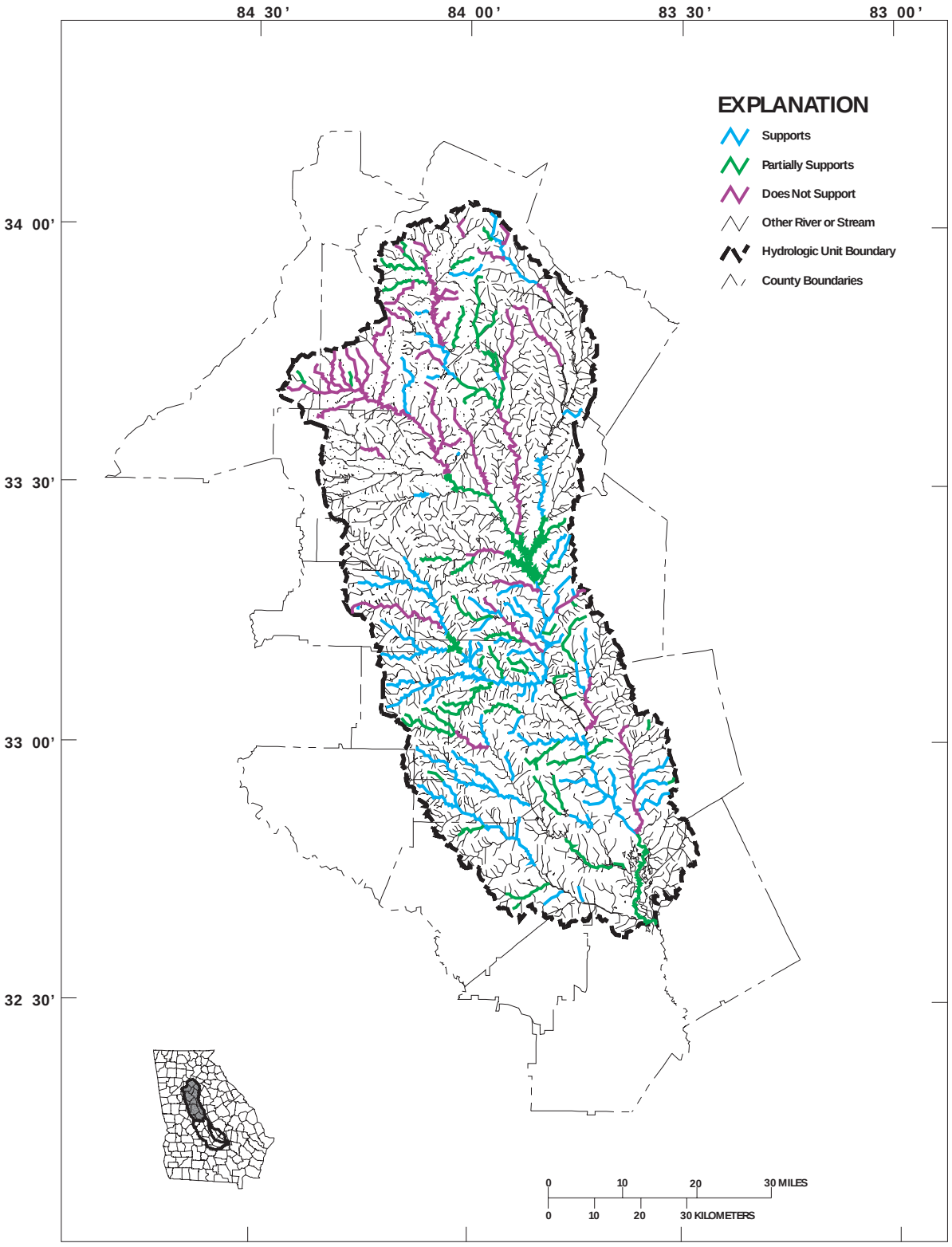


**Figure 5-2. Geographic Summary of Assessment Results in the Ocmulgee River Basin, HUC 03070103 (Upper Ocmulgee River)**

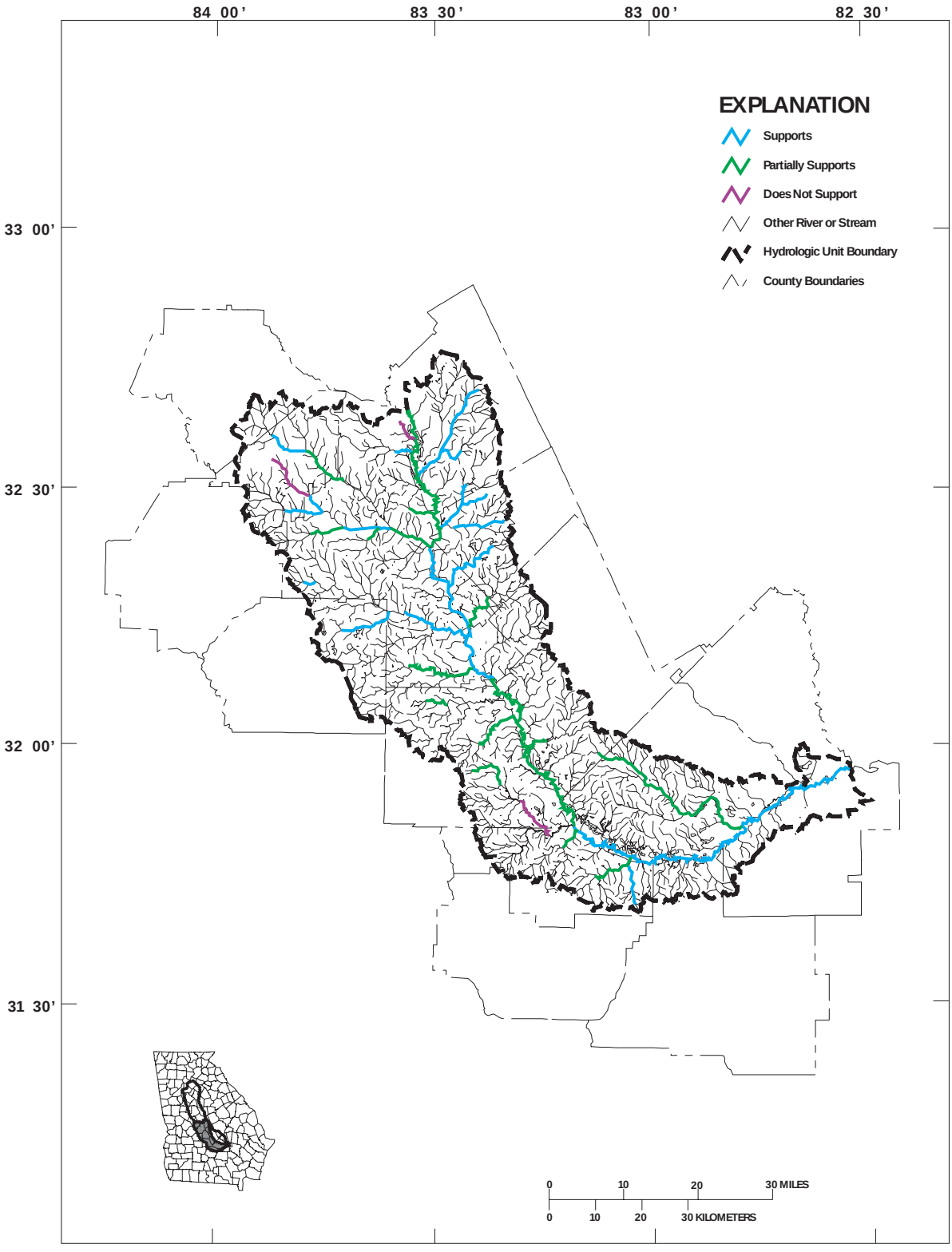


**Figure 5-3. Geographic Summary of Assessment Results in the Ocmulgee River Basin, HUC 03070104 (Lower Ocmulgee River)**

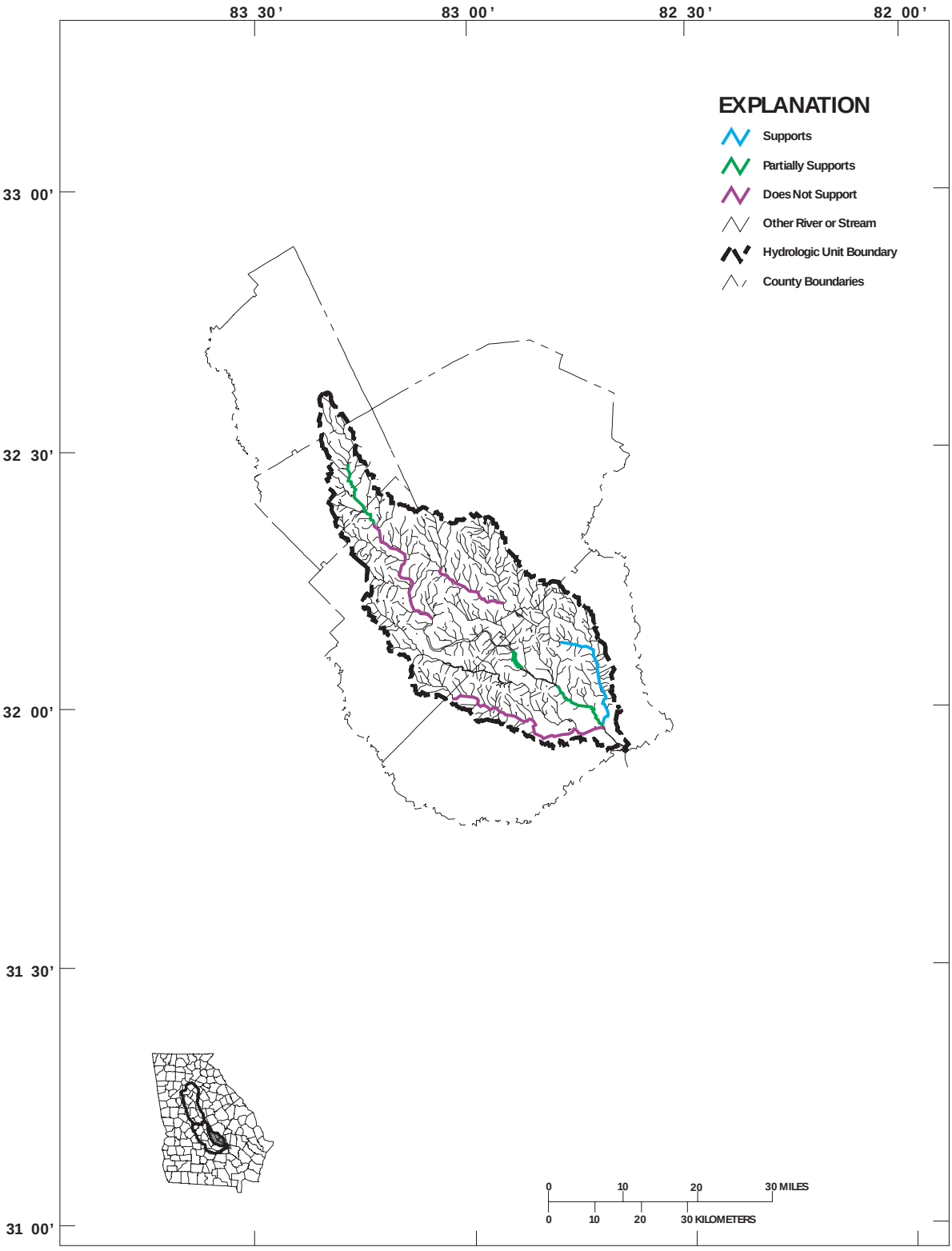


**Figure 5-4. Geographic Summary of Assessment Results in the Ocmulgee River Basin, HUC 03070105 (Little Ocmulgee River)**

*Low Dissolved Oxygen*

The water use classification of fishing was not fully supported in two tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen concentrations coincided primarily with low or zero flows, slow stream velocities, shallow water depths, and high temperatures. Natural conditions may contribute to the cause of low dissolved oxygen in streams in the Ocmulgee River basin.

*pH*

The water use classification of fishing was not fully supported in one tributary stream segment due to pH levels below the minimum pH standard of 6.0. It is not known whether the pH violations are due to nonpoint source influences or natural conditions.

*Toxicity*

The water use classification of fishing was not fully supported in two tributary stream segments due to toxicity. Aquatic toxicity tests of effluent from dischargers predicted toxicity in the receiving streams at critical, low flow conditions.

**Lower Ocmulgee River Subbasin (HUC 03070104)**

Appendix D summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2002).

Monitoring data was collected from 14 stations located within this subbasin during 1999. Of those, one is sampled monthly each year, and the remaining were sampled only during 1999 as part of the focused trend monitoring strategy described in Section 5.2.2. The following assessment is based on data primarily from 1999.

Two segments of the Ocmulgee River and 16 tributary segments (totaling 210 miles) were assessed as supporting the water use classification of fishing. Criteria affecting use support are discussed in the following subsections for this HUC.

*Erosion and Sedimentation*

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment, which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There are 15 stream segments listed in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

*Fecal Coliform Bacteria*

The water use classification of fishing and/or drinking water was not fully supported in two Ocmulgee River mainstem segment and three tributary stream segments due to exceedances of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and/or animal wastes.

*Fish Consumption Guidelines*

The water use classification of fishing was not fully supported in two Ocmulgee River mainstem segments due to PCB residues in fish tissue. The guidelines are for flathead catfish.

*Low Dissolved Oxygen*

The water use classification of fishing was not fully supported in four tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen concentrations coincided primarily with low or zero flows, slow stream velocities, shallow water depths, and high temperatures. Horse Creek in Houston County was also affected by a municipal water pollution control plant. The plant relocated its

discharge point from Horse Creek to the Ocmulgee River on August 31, 1999. Natural conditions may contribute to or be the cause of low dissolved oxygen in many streams in the Ocmulgee River basin.

*Metals*

The water use classification of fishing was not fully supported in one Ocmulgee River mainstem segment due to exceedance of metals standards (mercury) from nonpoint sources.

*pH*

The water use classification of fishing was not fully supported in two tributary streams due to pH levels below the minimum pH standard of 6.0. It is not known whether the pH violations are due to point source influences, nonpoint source influences, or natural conditions.

**Little Ocmulgee River Subbasin (HUC 03070105)**

Appendix D summarizes the determination of support for designated uses of all assessed rivers and streams within this hydrologic unit (GA DNR, 2002).

Monitoring data was collected from seven stations located within this subbasin during 1999. All were sampled only during 1999 as part of the focused trend monitoring strategy described in Section 5.2.2. The following assessment is based on data from 1999.

One tributary segments was assessed as supporting the water use classification of fishing. Criteria affecting use support are discussed in the following subsections for this HUC.

*Erosion and Sedimentation*

The water use classifications of fishing, recreation, and drinking water are potentially threatened in waterbodies by erosion and loading of sediment, which can alter stream morphology, impact habitat, and reduce water clarity. Potential sources include urban runoff and development (particularly construction), unpaved rural roads, forestry practices, and agriculture. There is one stream segment listed in this subbasin as not fully supporting designated water uses due to poor fish communities or sedimentation.

*Fecal Coliform Bacteria*

The water use classification of fishing was not fully supported in two tributary stream segments due to exceedances of the water quality standard for fecal coliform bacteria. These may be attributed to a combination of urban runoff, septic systems, sanitary sewer overflows, rural nonpoint sources, and/or animal wastes.

*Fish Consumption Guidelines*

The water use classification of fishing was not fully supported in Little Ocmulgee State Park Lake (Gum Creek Swamp) in Telfair and Wheeler Counties based on mercury residues in fish tissue. The assessment for mercury is based on the Trophic-Weighted Residue Value being in excess of 0.3 mg of mercury per kilogram of fish tissue. See Box 5-2 for details regarding assessment of mercury in fish tissue.

*Low Dissolved Oxygen*

The water use classification of fishing was not fully supported in one Little Ocmulgee River mainstem segment and four tributary stream segments due to dissolved oxygen concentrations less than standards. Low dissolved oxygen concentrations coincided primarily with low or zero flows, slow stream velocities, shallow water depths, and high temperatures. Natural conditions may contribute to or be the cause of low dissolved oxygen in many streams in the Ocmulgee River basin.

*pH*

The water use classification of fishing was not fully supported in one tributary stream segment due to pH levels below the minimum pH standard of 6.0. It is not known whether the pH violations are due to point source influences, nonpoint source influences, or natural conditions.

## References

Georgia Department of Natural Resources. 2003. Guidelines For Eating Fish From Georgia Waters, 2003 Update.

Georgia Environmental Protection Division 1987. Water Availability and Use Report, Ocmulgee River Basin.

DRI/McGraw Hill. 1996. The Regional Economic Forecast of Population and Employment Comprehensive Study, Volume 1. Prepared for: Georgia Department of Natural Resources Environmental Protection Division. DRI/McGraw-Hill, Lexington, MA.

EPD. 2002. Water Quality in Georgia, 2000-2001. Georgia Department of Natural Resources, Environmental Protection Division, Atlanta, Georgia.

1998-2000 Georgia Drought Report. Georgia Department of Natural Resources, Environmental Protection Division.

United States Environmental Protection Agency. 1997. Mercury study report to Congress. Volumes I-VII. December 1997.

USEPA. 2000. Methodology for deriving ambient water quality criteria for the protection of human health(2000). Office of Science and Technology, Office of Water. Washington, DC. EPA-822-B-00-004.

USEPA. 2001. Water quality criterion for the protection of human health: methylmercury. Office of Science and Technology, Office of Water. Washington, DC. EPA-823-R-01-001. January 2001.